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Feature Article - What Dominates Movements in ABS Seasonally Adjusted Time Series?

INTRODUCTION

The short term movement of many seasonally adjusted economic indicators can be affected by irregular influences in those series. In the March 1992 issue of **Australian Economic Indicators,** the feature article “Smarter Data Use” noted that irregular influences often dominated short term movements in the seasonally adjusted series and advised users of Australian Bureau of Statistics (ABS) data to use trend rather than seasonally adjusted for interpreting the underlying behaviour of a series.

This article, as in March 1992, presents and analyses empirical measures of the relative contribution of irregular influences to growth for several main economic indicators. The analysis concludes that irregular influences continue to dominate movements in many ABS seasonally adjusted series. The trend, which estimates and removes irregular influences from the seasonally adjusted series, remains the preferred series for interpreting the underlying behaviour of a series.

TIME SERIES COMPONENTS

ABS time series statistics are published in three forms : original, seasonally adjusted and trend.

- **Original estimates** are the actual estimates the ABS derives from the data supplied by respondents to its surveys or other non-survey sources. Original estimates are affected by systematic calendar related influences, irregular influences and trend behaviour.
- **Seasonally adjusted estimates** are derived by estimating the systematic calendar related influences and removing them from the original estimates. Seasonally adjusted estimates as well as capturing trend behaviour still contain irregular influences that can mask the underlying month to month or quarter to quarter movement in a series.
- **Trend estimates** have neither systematic calendar related influences nor irregular influences present in them and are thus a better measure of the underlying behaviour of the series.

Seasonal and trading day factors are estimates of the effect that the systematic calendar related influences have on ABS time series. Similarly, irregular factors are estimates of the effect that irregular influences have on ABS time series. Irregular influences are unpredictable and are not systematic or calendar related. Examples of irregular influences are those caused by one-off effects such as major industrial disputes or abnormal weather patterns. Sampling and non-sampling errors that behave in an irregular or erratic fashion with no noticeable systematic pattern are also irregular influences.

ILLUSTRATING THE CONTRIBUTION OF IRREGULAR INFLUENCES

In this section, a collection of ABS main economic indicators is used to illustrate the contribution irregular influences have made to movements in seasonally adjusted series. Selected monthly and quarterly series over two five yearly time periods, 1990-1994 and 1995-1999, have been used.

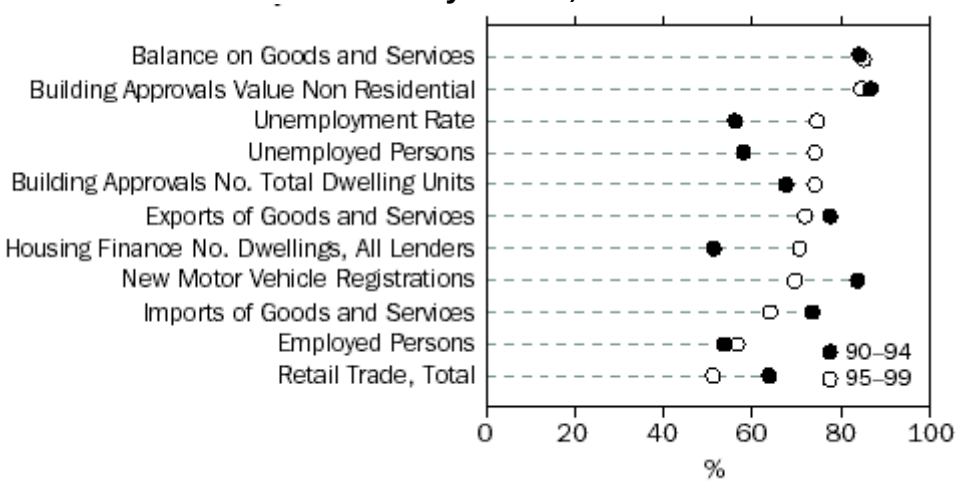
The time series decomposition model can be used to derive a **relative contribution of volatility to growth** measure of the contribution irregular influences make to movements in a seasonally adjusted series. Technical details of how this measure is derived can be found in the Appendix.

SELECTED MONTHLY SERIES

Graph 1 displays median r**elative contribution of volatility to growth** values for a selection of monthly economic indicators. During the two five year periods 1990-1994 and 1995-1999, the median contribution of irregular influences to all these monthly series was over 50%. Irregular influences dominated movements in each of these seasonally adjusted series in at least 30 of the 60 estimates obtained during each five year period.

In the last five years **relative contribution of volatility to growth** ranges from over 85% in the monthly balance on goods and services series to over 51% in the retail trade series. The range during the 1990-1994 period was comparable although the seasonally adjusted series which had the largest or smallest contributions from the irregular component differed between the two periods.

2. RELATIVE CONTRIBUTION OF IRREGULAR TO GROWTH
Selected Monthly Series, 1990-1999



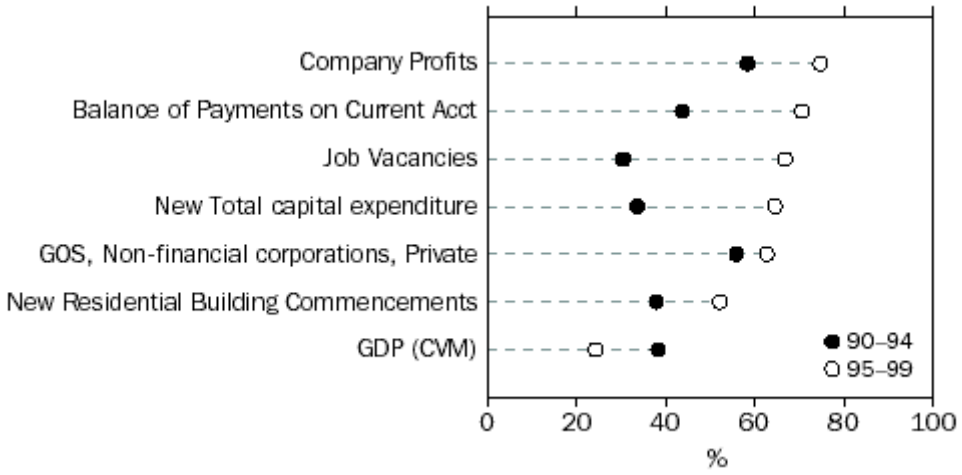
SELECTED QUARTERLY SERIES

Graph 2 displays median **relative contribution of volatility to growth** values for a selection of quarterly economic indicators. During the five year period 1990-1994, the median contribution of irregular influences to movements in these quarterly seasonally adjusted series was over 30%. The median contribution was over 50% in two of the series, namely the company profits and private non financial corporations gross operating surplus series. This is not surprising given the company profit series is the main data source for the private non-financial corporations gross operating surplus series.

During 1995-1999, the median contribution of irregular influences to movements in the seasonally adjusted quarterly series was over 60% in five of the seven series presented. This is an increase over the 1990-1994 period. In the remaining two series, the median contribution of the irregular was over 52% in the new residential building commencements series and over 24%

in the chain volume measure of gross domestic product, GDP (CVM), series.

2. RELATIVE CONTRIBUTION OF IRREGULAR TO GROWTH
Selected Quarterly Series, 1990-1999



As with the monthly series, the relative contribution of volatility to growth values indicate the continued dominance of irregular influences in movements in the seasonally adjusted series, except for the chain volume measure of GDP. The trend for GDP (CVM) has been relatively constant since 1990, so the reduction in the relative contribution of volatility to growth is indicative of the reduced volatility of the series.

CHANGING CONTRIBUTION OF THE IRREGULAR

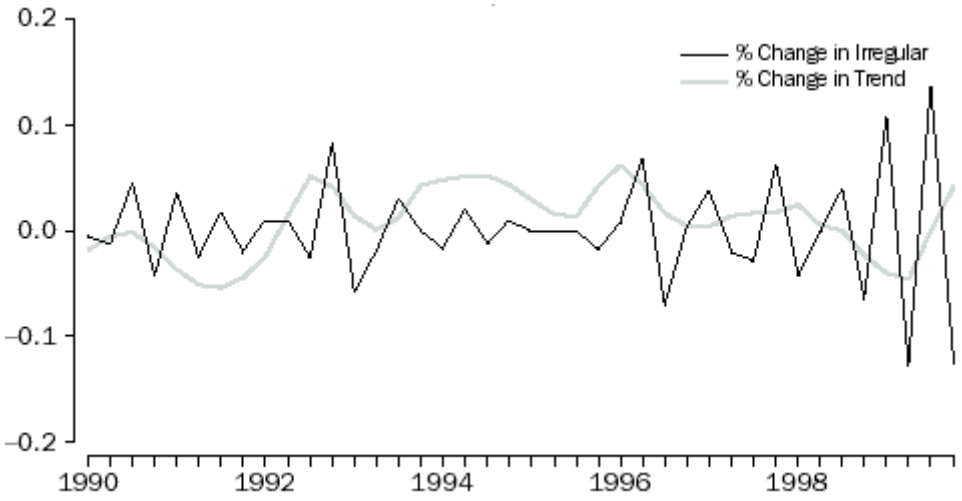
The previous section illustrated that irregular influences have dominated movements in a wide selection of seasonally adjusted series. It also showed that the median contribution of the irregular can change over different time periods.

There can be several reasons for the median contribution of the irregular to increase or decrease over time. The key issue is that if the relationship between the irregular (|DI|) and the trend (|DT|) changes, then so too will the relative contribution of volatility to growth measure.

Changes to the behaviour of the trend component can affect the relative contribution of volatility to growth measure. The measure will increase if the absolute change in the trend (|DT|) decreases (eg. the trend becomes flat) but the irregular (|DI|) remains steady or constant. Changing economic conditions in the real world can lead to this situation. In particular, for current price series such as Gross Operating Surplus, long periods of low inflation lead to a smaller contribution of the absolute change in the trend |DT| relative to the irregular |DI|.

Likewise, changes to the behaviour of the irregular can also affect the relative contribution of volatility to growth measure. For example, the behaviour of the irregular influences in the total new capital expenditure series have changed in recent years whereas the behaviour of the trend has been fairly unchanged as shown in graph 3 below. Possible changes to the seasonal pattern over the last 4 quarters coupled with the presence of increased real-world irregularities in new capital expenditure are contributing factors. Further investigations by the ABS into this series are currently underway.

3. TOTAL NEW CAPITAL EXPENDITURE1990-1999



CONCLUSION

This article has illustrated that a substantial proportion of the movement in a seasonally adjusted series is attributable to irregular influences. Given this, users of ABS economic indicators should carefully assess whether the seasonally adjusted series is 'fit for purpose'. The dominant impact of the irregular component in
seasonally adjusted movements occurs in most economic series and is the reason why the ABS recommends using the trend series for interpreting the underlying behaviour of a series.

REFERENCES

- **A Guide to Interpreting Time Series - Monitoring "Trends" An Overview,** ABS Cat. no. 1348.0, 1993
- **Australian Economic Indicators, Smarter Data Use,** ABS Cat. no. 1350.0, March 1992
- **Australian Economic Indicators, Using the Unemployment Rate Series to Illustrate the Seasonal Adjustment Process**, ABS Cat. no. 1350.0, May 2000

FOR FURTHER INFORMATION

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APPENDIX

Measuring the contribution of the irregular component

The time series decomposition model can be used to derive a measure of the contribution irregular influences make to movements in a seasonally adjusted series.

There are two components to a seasonally adjusted estimate (SA): the underlying trend estimate (T) and an irregular component (I). One measure of the irregular component can be obtained by subtracting the trend estimate from the seasonally adjusted estimate (I = SA - T).

Measuring the contribution of the irregular to movements in the seasonally adjusted series involves examining changes in its two components : the change in the irregular component (DI)

and the change in the trend (DT). The change in the irregular component is obtained by subtracting the change in the trend estimate from the change in the seasonally adjusted estimate (DI = DSA - DT).

Changes in the seasonally adjusted estimate or its components can take on positive or negative values. It is possible that the change in the irregular component could cancel out a change in the trend leaving no net movement in the seasonally adjusted series. If we were to compare the change in the irregular component to the change in the seasonally adjusted series, this would overstate the contribution of the irregular component.

To avoid this situation we use absolute values of each component. That is, we compare the absolute value of the change in the irregular (|DI|) to the sum of the absolute value of the change in the irregular (|DI|) and the absolute value of the change in the trend (|DT|). This measure is then termed the **relative contribution of irregularity (volatility) to growth** or RCVG, and is mathematically represented by (|DI|)/(|DI| + |DT|).

At each point in time, the RCVG measures the contribution of the irregular component to the movement in the seasonally adjusted estimate. A result over 50% will indicate that the irregular component has dominated the movement in the seasonally adjusted estimate. For example, in December 1999 the movement in the seasonally adjusted retail turnover series was -0.8% and it had a RCVG value of 79%. This indicates that over three quarters of the seasonally adjusted movement of -0.8% was due to irregular influences and only 21% was due to the trend.

Individual **relative contribution of volatility to growth** values can be summarised over time to get a RCVG measure for movements in a seasonally adjusted series rather than individual monthly or quarterly seasonally adjusted estimates. The trend series will provide a better indication of the underlying behaviour of a series when irregular influences frequently dominate movements in the seasonally adjusted series .

The median is the preferred summary statistic for the relative contribution of volatility to growth measure. A median indicates what value the RCVG exceeds fifty percent of the time. For example, the median RCVG for the Retail Trade series over the last five years was 51%. This means that in 30 out of the last 60 monthly estimates, irregular influences contributed 51% or more to movements in the seasonally adjusted series.

Interpreting the RCVG Measure

The **relative contribution of volatility to growth** measures the relative contribution of a change in the irregular component to a change in itself and the trend. It is not intended to reflect the degree of irregularity alone. For example, a small|DI| or a large|DI| can lead to the same RCVG depending on its relationship with |DT|. For this reason, using **relative contribution of volatility to growth** values to compare the magnitude of the irregular alone between different economic series is not recommended.

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